

# MONTHLY WEATHER REVIEW,

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(General Weather Service of the United States.)

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WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

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## INTRODUCTION.

In preparing this REVIEW the following data, received up to October 14th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 131 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means 147 and 152 respectively, from the former; reports from 29 Sunset stations; 240 monthly registers from Voluntary Observers; 28 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Service of, Missouri; reliable newspaper extracts; special reports.

## BAROMETRIC PRESSURE.

Upon chart No. II is shown by the isobaric lines the general distribution of atmospheric pressure, as reduced to the sea level, for the month. East of the Rocky Mountains the pressure during the month has been above the average for the past seven years, at all stations except Key West, Punta Rassa, New Orleans, Vicksburg, and Pembina, at which stations the difference is zero. The excess has in general ranged from 0.02 at the other stations on the Gulf coast, 0.05 along the Atlantic coast, in the Lake region and Northwest to 0.08 in the Ohio valley. On the Pacific coast the difference is very small.

The *Local Barometric Ranges* have been greatest over the Northwest and Lake Region and over a narrow belt from New Orleans to Ohio in the track of storm area No. I; and least along the South Atlantic coast and from Texas to California. Taken by districts they vary as follows: Atlantic States from 0.79 of an inch at Eastport to 0.26 at Key West; Gulf States, 0.42 at St. Marks and 0.45 at Indianola to 0.82 at New Orleans; Tennessee and Ohio Valley, 0.72 at Cairo to 0.96 at Cincinnati; Lake Region, 0.86 at Oswego and 0.71 at Milwaukee to 1.05 at Port Huron; the Northwest, 0.66 at St. Louis to 1.05 at Yankton; Rocky Mountains, 0.43 at Santa Fe to 0.59 at Denver; Pike's Peak, 0.37; Western Plateau, 0.31 at Tucson, Ariz. to 0.45 at Pioche and Winnemucca and 0.66 at Boise; California, 0.24 at San Diego to 0.29 at Red Bluff and 0.31 at Visalia; Oregon, 0.72 at Roseburg and 0.89 at Portland.

*Areas of High Barometer.*—Of these, five have been sufficiently marked to merit description.

No. I.—This area was present off the coast of Oregon and Washington Territory at the morning report of September 1st, the barometer at Portland being 0.14 inch above the normal. The area moved eastward, and on the morning of the 3rd, was central near Bismarck, the barometer at that station being 0.29 inch above the normal. North and northwest winds prevailed throughout the Northwest, the Upper Mississippi and Lower Missouri valleys, and over the Upper Lakes. The minimum temperature reported was 33° at Fort Stevenson, Dakota. Moving southward the area was central at North Platte, Nebraska, on the morning of the 4th, barometer 0.22 inch above the normal. On the morning of the 5th the area was central near Cairo, Illinois, barometer 0.12 inch above the normal; the temperature in the Lower Lake region, the southern portion of the Upper Lakes and in Upper Mississippi valley, was slightly below the normal, and generally clear weather prevailed throughout the United States, excepting in the extreme Northwest and in Maine. During the 6th and 7th the area moved eastward and disappeared off the South Atlantic coast. High winds were reported from stations on Lake Michigan on the 3rd.

No. II—made its appearance in the Northwest on the 7th, the barometer at Bismarck, Dak., at the morning report being 0.25 in. above the normal. Frost was reported from Fort Stevenson and Deadwood, Dak. The morning report of the 8th showed the area central near Breckenridge, Minn., barometer 0.29 in. above the normal. Light frost was reported from Davenport, Iowa. At the afternoon report of the 9th the pressures at all stations east of the Mississippi river, excepting those in the New England States, were above the normal, the area being then central over Lake Michigan. The temperatures were below the normal in the Lake region, the upper Mississippi and Ohio valleys and Tennessee, and in the Middle and South Atlantic States. Cautionary Off-Shore Signals were ordered up at 12.45 a. m. of the 8th at Sandy Hook, Atlantic City, and Cape May. The signals were justified by velocities of 35 miles at Cape May, 30 miles at Atlantic City, and 32 miles at Sandy Hook. The winds, which had been southerly on the South Atlantic coast, veered to the north during the night of the 8th, and high winds, 48 miles at Cape Lookout, and 25 miles at Cape Henry, were reported at midnight of that date. Cautionary Signals were ordered at Cape Henry, Kittyhawk, Cape Hatteras, Macon, Cape Lookout, and Smithville, at midnight of the 8th. These signals were lowered at 6.30 p. m. of the 9th, having been fully justified. During the 9th, 10th, and 11th, the area moved eastward, and at midnight of the 11th was off the New England and Middle Atlantic coasts. On the morning of the 12th it had disappeared.

No. III—made its appearance on the Oregon coast on the 9th, the barometer having risen during the night of the 8th at all stations on the Pacific coast north of Sacramento, Cal. At the morning report of the 10th the barometer at Portland, Or., was 0.25 above the normal. The barometer continued rising rapidly in Oregon, and thence eastward to Dakota, the most rapid rise being at Virginia City, Mont., a rise of 0.21 in eight hours being reported from that station at the afternoon observation of the 10th. The area moved slowly to the southeast, and on the morning of the 13th was central near North Platte, Neb., where the barometer was 0.28 above the normal. At the morning report of the 14th the area was central near Cairo, Ill.; thence during the 14th, 15th and 16th it moved northeastward over the Ohio valley, the Middle Atlantic and New England States, and disappeared. Generally cool weather marked the passage of this area across the country. Frost was reported from Dodge City on the 11th, and Davenport, Iowa, on the 14th. The minimum temperatures for the month were induced by this area at Cheyenne, North Platte, Vicksburg, Miss., New Orleans, La., and Mobile, Ala.

No. IV—appeared in the Northwest on the 17th, the Bismarck barometer being 0.27 inch above the normal at the midnight report of that date. At the morning report of the 18th, the barometer was 0.34 inch above the normal at Bismarck and Breckenridge and was rapidly rising on the Upper Lakes and in the Upper Mississippi and Lower Missouri valleys. Moving southeastward it was central at Davenport, Iowa, on the morning of the 20th, thence moving northeastward, it was central on Lake Huron on the morning of the 21st, and at Chatham on the morning of the 22nd. The pressures remained high in New England and the Middle Atlantic States and the Maritime Provinces of Canada during the 22nd, and gradually fell on the approach of low area No. VII. The minimum temperatures reported during the passage of the area, were Breckenridge, Minn., 24° on the 18th; 36° at St. Paul and Dubuque and 34° at Des Moines on the 20th. These were the minimum temperatures for the month at these stations. Cautionary Signals were ordered up, in advance of this area, at Cape Hatteras, Lookout, Kittyhawk and Macon at the midnight report of the 19th, at Cape Henry, Wilmington and Smithville at 9:20 a. m. of the 20th, and from Norfolk to New Haven during latter part of 20th and morning of 21st. The signals at Smithville and Wilmington, were lowered at 11:50 p. m. on the 21st, those from Norfolk to New Haven on the afternoon and midnight of the 22nd, and at Macon, Lookout, Hatteras, Kittyhawk and Henry at 9 a. m. of the 23rd, having been fully justified. The maximum velocity of wind reported was 47 miles at Cape Henry. Cautionary Signals were ordered up at Indianola and Galveston at the afternoon observation of the 19th. The signals were not justified at these stations, but rough weather and high N. winds were experienced on the Gulf, and eleven vessels were lost on the 19th near Santa Anna, Mexico, during "a severe norther."

No. V—followed in rear of low area No. VII. At the morning report of the 23rd, the line of 0.30 in. above the normal pressure embraced within its limits Bismarck, Breckenridge and Pembina—the temperature at Pembina at this report, was 19° (26° below the normal), the minimum temperature reported from any station within the United States during the month. The temperatures reported from stations in the United States were, with a few exceptions, below the normal. The pressure continued increasing in the Northwest during the 23rd, the area remaining nearly stationary during that day. Moving first southeastward and then eastward, the area was central in Iowa on the morning of the 24th, at Indianapolis, Ind. on the morning of the 25th, and at Albany on the morning of the 26th. The pressures remained above the normal in the eastern portion of the United States during the remainder of the month, the area being central off the South Atlantic coast at the midnight report of the 30th. This area was accompanied by very low temperatures, the minima temperatures for the month for the Upper Mississippi and the Ohio valleys, the Lake region, New England and the Middle and South Atlantic States. Frost was reported from Yankton on the morning of the 24th, from Toledo, Ohio, Indianapolis, Ind., Cairo, Ill., Cincinnati, Ohio and Pittsburgh, Pa., on the morning of the 25th, and from Burlington, Vt., Albany, N. Y., New Haven, Philadelphia, Washington, D. C., Lynchburg, Va. and Charlotte, N. C., on the morning of the 26th. Cautionary Off-shore Signals were ordered in advance of this area at capes Lookout and Hatteras at 6:42 p. m. of the 24th; these were changed to Cautionary Signals at midnight of the same date, and signals were ordered up at Cape Henry, Kittyhawk, Macon and Norfolk. The signals were lowered at 11:50 p. m. of the 26th, having been fully justified. The Off-shore signals ordered on the New England and New Jersey coasts, are considered in connection with low area No. VII.

*Areas of Low Barometer.*—Nine areas have been sufficiently marked to merit description, but the centers of only seven have followed tracks well enough defined to enable them to be properly located on the charts. The tracks of these seven are shown on Map No. I.

No. I.—This storm was a continuation of low area No. XI described in the August REVIEW. On the morning of the 1st the area was central over the Gulf of Mexico, southwest of New Orleans, at which station the barometer was 0.45 inch below the normal, and the wind was blowing with a velocity of 26 miles from the east. Cautionary Signals had been ordered up at Indianola, Galveston, New Orleans, Port Eads, and Mobile, on the morning of August 30th, and were still displayed and had been justified at all the stations excepting Mobile. East of the Rocky Mountains, excepting in the extreme Northwest, the barometer was below the normal. Cloudy weather and rain were reported from the southern portion of the South Atlantic States, the Eastern Gulf States, and from Tennessee. At the afternoon report of the 1st the storm was central northwest of New Orleans. The barometer had continued to fall rapidly in the lower Mississippi valley, being now 0.61 in. below the normal at New Orleans, 0.41 at Vicksburg, 0.29 at Shreveport, and 0.36 at Mobile. The barometer had risen slightly in the Lake region; elsewhere it had fallen. Cloudy weather and rain continued in the Mississippi valley, the Eastern Gulf and South Atlantic States and Tennessee, and were reported from the Ohio valley. Light rains were reported from Chicago, Toledo, and Milwaukee. High winds were reported from Indianola, Galveston, and New Orleans, the maximum velocity reported being 40 miles at the latter station. The temperature had fallen, since last preceding report, in the Lake region, and thence southward to the Gulf States. Elsewhere it had risen. Cautionary Signals were ordered up at Toledo and Sandusky. At the midnight report the area was central in southern Mississippi. The barometer remained nearly stationary, but had risen slightly at the Gulf stations. The wind at New Orleans had veered to W. and at the time of the report was blowing with a velocity of 26 miles. Maximum velocity since last report, 36 miles. The wind at Mobile remained southeast, and the signal at that station had been justified. The area of cloud and rain had extended itself northward, generally cloudy weather and numerous rains being reported from the Lake region. Heavy rain (1.69 in. in 8 hours) accompanying a thunder-storm was reported from Sandusky; heavy rain-falls were also reported from Indianapolis, Louisville, and Chattanooga. The temperatures remained nearly stationary. Cautionary Signals were lowered at Indianola and Galveston, and ordered up at Cleveland, Detroit, and Port Huron. On the morning of the 2nd the storm was still central in southern Mississippi, having moved slowly northward. The barometer had risen rapidly in the Gulf, a rise of 0.22 in. in 8 hours being reported from New Orleans. It had fallen in the Lake region, the South Atlantic States, Tennessee and the Ohio valley. The temperatures had risen slightly in the same districts and in the Eastern Gulf States and Lower Mississippi valley, the greatest rise, 9° in 8 hours, was reported from Louisville. The winds in the Lower Lake region and southern portion of the Upper Lake region had become N.E. or E., and a velocity of 25 miles was reported from Toledo, Ohio. Cloudy weather and rain prevailed in the Lake region, Tennessee, the Ohio valley and the South Atlantic States. Heavy rain was reported from Indianapolis and Cincinnati. Cloudy weather was reported from the Middle Atlantic States, with light rain at Lynchburg, Va. West of the Mississippi river, clear weather prevailed, and a slight fall in temperature was reported. The afternoon report of the 2nd showed the storm central at Nashville, Tenn. Cloudy weather and rain prevailed from the Mississippi river north of Vicksburg to New England. The barometer had risen slightly in New England, the Northwest and in the Gulf States, elsewhere it had fallen, the greatest fall 0.14 in. in 8 hours, being reported from Nashville. In New England and west of the Mississippi the temperature had risen; elsewhere it had fallen. Cautionary Signals were ordered up on the Atlantic Coast from Savannah, Ga. to New York, and on the lakes at Buffalo, Chicago, Milwaukee and Section One, Erie, Grand Haven and Section Three. The storm continued moving north, and at midnight of the 2nd was central at Louisville; barometer 0.54 in. below the normal. The barometer had fallen in the Lake region, the Ohio valley, the Middle Atlantic States and northern portion of the South Atlantic States; elsewhere, it had remained stationary or risen slightly. The temperature remained nearly stationary. Heavy rain-falls, 1.70 in. from Indianapolis, 1.40 in. from Louisville, and 1.23 in. from Cincinnati, were reported. Cautionary Signals were ordered for Alpena. At the morning report of the 3rd, the storm was central in western Ohio, Cincinnati barometer 0.54 in. below the normal. The barometer had risen in the Northwest and Tennessee, and had fallen rapidly in the Lake region and the Middle Atlantic States; elsewhere, it had remained nearly stationary, with slight changes in temperature. Clear or partly cloudy weather prevailed, except in the Lake region, the Ohio valley and the Middle and South Atlantic States, in which districts cloudy and rainy weather continued. Cautionary Signals were ordered for Escanaba, Marquette, Duluth, Rochester, Oswego and Section Six. At the afternoon report of the 30th, the depression was central near Port Huron—barometer 0.60 in. below the normal. The barometer had fallen rapidly in advance of the center, the greatest fall 0.21 in. in 8 hours, being reported from Saugeen, and had risen rapidly in rear of the center, the greatest rise 0.32 in. in 8 hours, being reported from Cincinnati. The temperature had fallen in the Lake region, Tennessee and the Ohio valley, the South Atlantic States and New England; elsewhere, it had remained stationary or had risen slightly. Cautionary Signals were ordered down at Savannah and Charleston. High winds were reported from Duluth, Milwaukee, Grand Haven and Erie on the lakes, and Kittyhawk and Sandy Hook on the Atlantic coast. Heavy rain continued in the Lake region. The weather in the South and Middle Atlantic States was rapidly clearing. At midnight of the 3rd the storm was central on Lake Huron, Saugeen barometer 0.61 in. below the normal, with N. to W. winds in the Upper

Lake region and SE. to SW. on the Lower Lakes. East of the Mississippi river the pressures remained below the normal, excepting in Maine, but were slowly recovering south of the Lakes and west of the Middle Atlantic States. In the Middle Atlantic States and New England and in Canada, the barometer continued falling. High winds were reported from Sandusky, Cleveland and Alpena. Clear or partly cloudy weather prevailed, excepting in the Lake region, New England and northern portion of the Middle Atlantic States. Cautionary Signals were ordered down from Smithville to New York, having been justified at all stations north of Cape Hatteras. On the morning of the 4th, the storm was central midway between Parry Sound and Toronto, with NW. to W. winds in the Lake region. Winds exceeding 25 miles per hour in velocity, were reported from Alpena, Saugeen, Toledo, Sandusky, Cleveland, Erie, Buffalo and Kingston, and clearing weather, with rising barometer, was reported from the Lake region. North of Tennessee and east of the Mississippi river, the winds still remained under the influence of the storm. At the afternoon report the storm was central northwest of Montreal. High winds were reported from Alpena, Erie, Rochester and Kingston, as occurring during the preceding eight hours, but at the time of report, the winds had fallen to brisk, and signals were ordered down at all stations on the lakes, excepting Port Huron. Pressures were rapidly recovering in rear of the storm, a rise of 0.30 inch being reported from Kingston. The storm continued moving northeastward, and at midnight of the 4th. was central north of Quebec. Cautionary Signals were ordered down at Port Huron. On the morning of the 5th, the centre was too far north of the Signal Service stations to accurately locate it. The pressures on the lakes rapidly recovered under the influence of the area of high barometer then central in the Ohio valley. This storm was very severe on lakes Huron and Erie, and many accidents to vessels were reported. The Steamer Bertschy was lost on lake Huron. The maximum velocity of wind during the storm was 43 miles at Sandusky at 9:45 p. m. on the 3rd. A number of casualties resulting from this storm have been reported from New Orleans. A fleet of coal boats was sunk above the city, loss estimated at \$103,000. The steamboat Trenton was capsized and with her cargo proved a total loss, value \$25,000. At Berwick and Morgan City the loss was estimated at about \$50,000 and several men were washed overboard from vessels and drowned in Calcasieu Pass. At Manderville, on Lake Pontchartrain, the damage to small boats, houses, etc., was estimated at \$5,000. The damage to the cotton crop, in districts visited by the storm, was estimated at about 10 per cent. of the value of the crop. Considerable damage was also caused to the sugar crop.

No. II—made its appearance in Manitoba on the 4th and pursuing a course a little south of east was central on the morning of the 5th NE. of Pembina, and on the morning of the 6th, on Lake Superior. At the afternoon report, it was central on the eastern shore of Lake Superior, thence pursuing a NE. course, it passed too far north to permit its path to be accurately charted. This area was accompanied by light rains on the Upper Lakes on the 5th and 6th, and on the Lower Lakes on the latter date. Cautionary Signals were ordered up at Duluth, Marquette, Escanaba, Milwaukee and Section One, Grand Haven and Section Three and Chicago on the afternoon of the 5th, and at Sandusky on the morning of the 6th, and were lowered at midnight of the 6th, having been justified at all stations excepting Duluth and Sandusky, by maximum velocities of W. 27 miles at Milwaukee, SW. 28 at Marquette and W. 30 at Grand Haven. The lowest barometer reported during the passage of this depression was 29.71 in., 0.28 in. below the normal, at Marquette on the morning of the 6th. No disasters were reported from any of the lake stations.

No. III—was central in Nebraska at the midnight report of the 6th, Omaha barometer 0.14 in. below the normal. Light rain had fallen since the afternoon report, at Yankton and St. Paul; elsewhere throughout the United States, clear or partly cloudy weather prevailed. The temperature was below the normal in the Upper Mississippi valley, the Upper Lake region and on Lake Erie. On the morning of the 7th, the barometer had fallen in the Upper Lake region, and had risen rapidly in the Lower Missouri valley. The temperature had remained nearly stationary. Cloudy weather and light local rains were reported from stations in the Upper Lake region. Heavy rain had fallen during the night at La Crosse, and light rain at St. Paul, but at the time of report, the rain had ceased, and clear or partly cloudy weather was reported; S. to W. winds prevailed in the Lake region. At the afternoon report, the depression was central near Detroit—Detroit and Port Huron barometers 0.16 in. below the normal. The barometer had fallen in the Lower Lake region and in Ohio, and had risen in the Northwest. Cloudy weather and local rains were reported from the Lake region, and from Tennessee and the Ohio valley. High NW. winds, maximum velocities 28 and 32 miles, were reported from Milwaukee and Grand Haven. Cautionary Signals were ordered up at Buffalo, Erie, Cleveland and Section Five, Sandusky, Toledo, Detroit and Port Huron on the lakes and at Cape May, Atlantic City, Barnegat and Sandy Hook on the New Jersey coast. At midnight the depression was central near Erie—Erie barometer, 0.24 in. below the normal. Light rains had fallen in the Lake region, the Middle Atlantic States and the Ohio valley, but in the latter district rain had ceased and clear weather was reported. High westerly winds, maximum velocity 29 miles, were reported from Sandusky. Cautionary signals were ordered for Lewes and New York or for stations on the New England coast from New York to Portland and the Cautionary signals on the New Jersey coast were changed to off-shore signals. Moving northeastward, the depression was central in Vermont on the morning of the 8th—Burlington barometer 0.31 in. below the normal. The barometer had risen in the Upper Lake region and on Lake Erie. Light rain had fallen in the Middle Atlantic States, New England and Ontario. Heavy rain accompanying a thunder-storm was reported from Boston. At the afternoon report the area was central in Maine, Portland barometer 0.34 in. below the normal. N. to W. winds prevailed in the Lake region and the Middle Atlantic States, and NW. to SW. winds in New England. The temperature had fallen rapidly, and the barometer

had risen in the Lake region, the Middle Atlantic States, the Upper Mississippi and Ohio valleys and in Tennessee. Cautionary Signals were ordered down at New York, at stations on the New England coast and at Buffalo, Erie, Cleveland and Section Five and Sandusky, having been justified on the lakes by maxima velocities of SW. 28 miles at Buffalo, W. 28 at Erie, W. 26 at Cleveland and W. 33 at Sandusky. At midnight the storm-center was northeast of Eastport, Eastport barometer 0.32 in. below the normal. N. to W. winds prevailed east of the Mississippi river, except in the Gulf and South Atlantic States. Cautionary Signals were ordered down at Detroit and Port Huron. On the morning of the 9th the depression was central in New Brunswick and thence, pursuing a northeasterly course, passed beyond the limit of the Canadian stations, and the pressures in New England, rapidly recovered under the influence of the area of high barometer then in the Lake region. The Off-shore Signals on the New Jersey coast, were ordered down on the afternoon of the 9th, having been justified by maximum velocities of wind, NW. 35 miles at Cape May, W. 32 at Sandy Hook. This storm was quite severe on Lake Erie, vessel captains reporting very rough weather and high winds on the lake.

No. IV.—During the 7th, the barometer fell at stations in Oregon and Washington Territory, and on the morning of the 8th an area of low barometer was present off the coast of Washington Territory, Olympia barometer, 0.25 in. below the normal. The temperature rose rapidly during the afternoon in eastern Idaho and Oregon and in northern Nevada, and fell rapidly in western portions of Washington Territory and Oregon, a fall of 17° in eight hours being reported from Olympia, and one of 18° from Portland. The barometer fell rapidly in Idaho and the eastern portion of Washington Territory, and the depression moving eastward was central northeast of Umatilla on the afternoon of the 8th, Umatilla barometer 0.20 in. below the normal. The barometer rose rapidly in rear of the depression, and light rains were reported from Olympia and Portland. During the evening the temperature rose in Montana, a rise of 20° being reported from Virginia City, and the depression moving southeastward was central, at the midnight report, near Boise City, Idaho, barometer 0.21 in. below the normal; thence moving eastward it was central northwest of Virginia City on the morning of the 9th, barometer 0.27 in. below the normal. At the afternoon report it was central in Montana—at this report, with the exception of light rains at Olympia, Wash. Ty., Portland and Roseburg, Oregon, and local rains in Texas and New England, clear or partly cloudy weather prevailed throughout the United States. So far, no precipitation had taken place in front of the depression. The temperature continued to rise rapidly in advance and fall rapidly in rear of the depression, which, at midnight, was in Dakota, Bismarck barometer 0.21 in. below the normal. Thunder-storms were reported from St. Louis and Cairo, elsewhere, except at a few of the Gulf stations, clear or partly cloudy weather prevailed. Moving southeastward, the depression was central in Kansas on the morning of the 10th, North Platte and Omaha barometers 0.21 in. below the normal. Cloudy weather was reported in the Lower Missouri valley and light rain was falling at Cairo and St. Louis. East of the Mississippi river, the pressures were above the normal, high area No. II. being central in the Lake region. NE. to SE. winds prevailed in the Lower Missouri valley and in Texas, and E. to S. winds in the Upper Mississippi valley and the Upper Lake region, and variable winds in the Lower Lake region; elsewhere, east of the Rocky Mountains, NE. to NW. winds prevailed. Moving slowly northeastward the area was central in southern Minnesota on the morning of the 11th. The pressure in the Upper Lake region, although still above the normal, had begun to give way, and the area of high barometer had moved eastward and was central over Lake Ontario. Light southerly winds and clear weather prevailed in the Lake region. Partly cloudy weather and southerly winds, with light rains, were reported from the Upper Mississippi valley. Thunder storms were reported from Dubuque, Des Moines, and Leavenworth accompanied by heavy rain at the latter station. In the afternoon the area was central in eastern Minnesota. East of the Mississippi the pressure had fallen and the area of high barometer was central off the Middle Atlantic coast. West of the Mississippi the pressure had risen rapidly, cloudy weather and light rains were reported from the Upper Mississippi and lakes Superior and Michigan; elsewhere east of the Mississippi clear or partly cloudy weather prevailed. The winds in the Lower Missouri valley and the Northwest had veered to NW. and W., and E. to S. winds prevailed on the Upper Lakes. Moving northeastward the depression was central over Lake Michigan on the morning of the 12th, Marquette barometer 0.29 in. below the normal. The winds in the Lower Lake region had veered to southerly, brisk NW. to W. winds prevailed on lakes Michigan and Superior. The barometer had fallen decidedly in the Lake region and was below the normal in the Upper Lake region and the Upper Mississippi valley; elsewhere, excepting southern California, the barometer was above the normal. Cautionary signals were ordered for Alpena, Port Huron, Detroit, Section Four, Toledo, Sandusky, Cleveland, Section Five and Erie. Cloudy weather and rain continued on lakes Michigan and Superior. The winds in Texas had become northerly and cloudy weather and rain prevailed in that state. At the afternoon report of the 12th the depression was central north of Lake Huron, Alpena barometer 0.20 in. below the normal. The barometer had fallen rapidly over Lake Huron and in Ontario, a fall of 0.21 in. in eight hours being reported from Saugeen, and was rising rapidly in the rear of the centre. Cloudy and rainy weather were reported from Lake Erie, Tennessee and the Ohio valley. A thunder-storm, accompanied by heavy rain, was reported from Sandusky, and high westerly winds at Milwaukee and Alpena. At midnight the area was central near Parry Sound. On the morning of the 13th it was northeast of Rockliffe, after which it moved off to the northeast accompanied by light rains in the St. Lawrence valley and leaving a subsidiary depression in the Lake region.

No. V—was a subsidiary area which formed in rear of the area just described. While area No. IV was moving off to the northeast, the barometer continued falling over lakes Huron and Erie, and on the afternoon of the 13th an area of low barometer was formed, central to the west of Detroit, Mich. Partly cloudy or cloudy weather and light local rains prevailed east of the Mississippi river. Fresh southerly winds prevailed on the Atlantic coast, and NW. winds with rising barometer in the Upper Mississippi valley. The pressures were below the normal over lakes Michigan and Huron, the Lower Lake region, the St. Lawrence valley, the Middle Atlantic States, the Ohio valley, and the western portion of New England. The Cautionary Signals ordered in advance of area No. IV remained, and signals were ordered for Cape May, Lewes, Atlantic City, Barnegat, and Sandy Hook on the New Jersey coast. At midnight the area was central over Lake Erie. High winds and squally weather were reported from Sandusky and Cleveland. Cloudy weather and rain continued in the Lower Lake region, in New England, and in the Middle and South Atlantic States. Rain had fallen during the preceding eight hours in Tennessee and the Ohio valley, but it had ceased raining at the time of the report, and clear and cooler weather was reported. The temperature had risen in New England and the eastern portion of the Middle Atlantic States; elsewhere it had fallen. Cautionary Signals were ordered down at Toledo, Detroit, Section Four, Port Huron and Alpena. On the morning of the 14th the depression was central near Buffalo. Cloudy weather continued in the Lower Lake region, the St. Lawrence valley, and the Middle Atlantic States. A thunder storm with heavy rain was reported from Sandusky. The pressures in the Northwest were falling rapidly. High northerly winds were reported from Lake Huron. An area of high barometer was central near Cairo, and moving slowly eastward. The Cautionary Signal at Cape May was changed to Off-Shore. At the afternoon report of the 14th, the area was central in New Hampshire. The barometer had risen in the Lake region and had fallen in New England and the Northwest. The Cautionary Signals at Sandusky, Cleveland and Section Four were ordered down, and the Cautionary Signals at Barnegat, Sandy Hook, and Atlantic City were changed to Off-Shore Signals. The signals displayed on the lakes were justified by velocities of SW. 27 miles at Cleveland, NW. 32 miles at Sandusky and 25 miles at Alpena, but were lowered too soon at Port Huron. Cloudy and rainy weather continued in the St. Lawrence valley, on Lake Ontario, and in New England. The weather in the Lower Lake region and the Middle and South Atlantic States rapidly cleared under the influence of the area of high barometer then advancing from the west. On the morning of the 15th the area was central in New Brunswick, northwest of Chatham. On the afternoon it had disappeared. The Off-Shore Signals at Sandy Hook, Cape May, Atlantic City, and Barnegat were lowered, having been justified at all stations except Sandy Hook.

No. VI.—During the 13th, the barometer fell in the Northern and Middle Plateau districts, the Northern and Middle Eastern Rocky Mountains slopes and in the Northwest, and on the morning of the 14th, an area of low pressure was central in northern Montana. Low area No. V, was still in the Lower Lake region, and an area of high barometer was central near Cairo, Ill. Moving eastward, area No. VI was central in northeastern Dakota in the afternoon. South to east winds, with clear or partly cloudy weather, prevailed on lakes Michigan and Superior and in the Upper Mississippi valley. The winds in Lake Huron and the Lower Lakes were still under the influence of area No. V., and cloudy and rainy weather prevailed in these districts. Since last preceding report the barometer had fallen rapidly in the Northwest, and had risen rapidly in the rear of the center. Cautionary Signals were ordered for Duluth, Marquette and Escanaba. At midnight, signals were also ordered for Milwaukee, Section one, Chicago, Grand Haven and Section three. During the night of the 14th, the barometer fell rapidly in the Upper Mississippi valley and over the Upper Lakes, the most rapid fall 0.30 in. in eight hours occurring at Marquette. On the morning of the 15th the area was central over Lake Superior, Duluth and Marquette barometers 0.33 in. and 0.30 below the normals respectively. Low area No. V had moved to the northeast and was passing over the Canadian Maritime stations. The area of high barometer had moved eastward and was central in the Middle Atlantic States. The winds in the Lower Lake region had become southerly. The winds were still southerly in the Upper Lake region and the Upper Mississippi valley, with the exception of those at Duluth and St. Paul, which had shifted to NW. Northwest winds prevailed in the Lower Missouri valley and the Northwest, in which districts the pressure had rapidly increased and the temperature fallen slightly. Cloudy weather was reported in the Upper Lake region and light rains had fallen at Escanaba and Marquette, the rain at latter station accompanying a thunder storm. Cautionary Signals were ordered for Alpena, Detroit, and Section Four, Port Huron, Toledo, Sandusky, Cleveland, and Section Five. The winds on Lake Michigan were veering to westerly and high winds, velocities equaling or exceeding 25 miles per hour, were reported from Escanaba, Milwaukee, Grand Haven, and Alpena. At midnight the area was central over the eastern portion of Lake Superior. Clear or partly cloudy weather prevailed on the Upper Lakes, except on Lake Huron, where cloudy and rainy weather continued. Cautionary Signals were ordered down at Grand Haven and Section Three. Continuing to move eastward, the storm was central, on the morning of the 16th, in western Ontario, and at midnight was still in Ontario, its center being northwest of Parry Sound. In the afternoon Cautionary Signals were ordered down at Chicago, Milwaukee, Section One, Escanaba, Marquette, Duluth, Sandusky, Toledo, Cleveland, and Section Five, too soon for stations on the Lower Lakes, as high winds were subsequently reported from Sandusky and Cleveland. On the morning of the 17th, the area was central north of Quebec, barometer 0.51 in. below the normal. Cloudy weather continued in New England, the St. Lawrence valley and on Lake Huron. Light rains had fallen in these districts during the night of the 16th. The area moved northeastward, accompanied by cloudy weather and light rains, and disappeared on the afternoon of the 18th.

No. VII.—During the night of the 19th, and morning of the 20th, the barometer fell in Dakota and Montana, and at the afternoon report of the latter date, an area of low pressure was central in northwestern Dakota. Cloudy and rainy weather prevailed in the South Atlantic States, the weather in New England and the Middle Atlantic States was rapidly clearing, and in all other districts clear or partly cloudy weather prevailed. An area of high pressure was central in the Lake region. The temperature in the Upper Lake region and the Upper Mississippi valley, had risen rapidly during the past eight hours. E. to S. winds prevailed in the Upper Mississippi and Lower Missouri valleys and N. to W. winds in Montana. Cautionary Signals were ordered for Duluth, Milwaukee and Section One. At midnight, the area was central south of Bismarck, at which station the barometer had fallen 0.19 in. within eight hours. Light rain was reported from Duluth. The barometer continued falling in Dakota during the night of the 20th, and the depression moving eastward was central southeast of Breckenridge on the morning of the 21st, and at midnight of the same date was in southern Minnesota. The morning map of the 22nd showed a shallow trough of low pressure extending southwestwardly from Lake Superior to Texas. The barometer continued to fall most rapidly in the Upper Lake region, in which district cloudy weather continued with light rains. Cautionary Signals were ordered down at Duluth. During the 22nd the barometer rose in the Northwest, the Upper Mississippi, the Lower Missouri and Ohio valleys, in Tennessee and the Eastern Gulf States, and the trough was divided into two weak areas of low barometer, one of which was central in Ontario northeast of Alpena, and the other central in northern Texas rapidly filled up and disappeared. The Cautionary Signals at Milwaukee and Section One were ordered down. They were not justified. Moving eastward, the depression was central north of Parry Sound on the morning of the 23rd. S. to W. winds prevailed on the Lower Lakes and in the St. Lawrence valley. Cloudy weather and light rains continued in the latter district. Since the morning of the 21st the barometer had been slowly rising in the extreme Northwest, and on the afternoon of the 23rd an area of high barometer was advancing to the southeast over Manitoba, Pembina barometer 0.30 in. above the normal. High northwest winds were reported from Marquette and Escanaba. Cautionary Signals were ordered for Milwaukee, Section One, Chicago, Alpena, Grand Haven and Section Three. N. to NW. winds were reported from the Upper Lakes and S. to W. winds from the Lower Lakes, Middle Atlantic States and New England. At midnight the low area was central near Father Point, barometer 0.19 below the normal. High NW. winds, maximum velocity 30 miles, were reported from Sandusky. The temperature had fallen and the barometer risen during the past 24 hours in the Northwest, the Upper Lake region and the Upper Mississippi valley, and light rains were reported from the Canadian Maritime stations, the St. Lawrence valley, the Lower Lake region, Lake Huron and the Ohio valley. Cautionary Signals were ordered up at Cape May and Sandy Hook on the New Jersey coast, at Buffalo, Rochester and Erie on the lakes. Moving nearly due south the depression was central west of Chatham on the morning of the 24th. The area of high barometer in the Northwest had advanced southeastward and was central in the Lower Missouri valley. The Cautionary Signals at Cape May and Sandy Hook were changed to Off-shore, and Off-shore Signals were also ordered for Atlantic City and Barnegat. The area was central south of Chatham at the afternoon observation, at which time Cautionary Signals were ordered up at Oswego and Section Six. At midnight the depression was central over the Gulf of St. Lawrence. Cautionary signals were ordered down at Chicago, Milwaukee, Section One, Sandusky, Toledo, Alpena, Grand Haven and Section Three. The morning report of the 25th showed that the depression had passed northeastward beyond the Canadian Maritime stations, and Cautionary signals were ordered down at Cape May, Sandy Hook, Atlantic City, Barnegat and at the lake stations, and Off-shore signals were ordered up for Newport, Wood's Holl, Boston, Section Eight, Portland, Section Seven and Eastport. The signals displayed on the lakes were justified at Detroit, Section Four, Toledo, Sandusky and Cleveland. Maximum velocity of wind NW. 36 miles at Sandusky. The Off-shore signals on the New England coast were lowered at the afternoon observation. They were not justified.

No. VIII.—During the 23rd, 24th and 25th a depression advanced eastward from the Pacific coast but its path was not well enough defined to be accurately charted. On the morning of the 26th it was central in eastern Dakota. Generally clear weather prevailed throughout the United States. East of the Mississippi river, in the Northwest and in the Lower Mississippi valley, the temperatures were below the normal, and frosts were reported from the Middle and South Atlantic States. From the 26th to the end of the month the pressure remained low in the Northwest and severe local storms were reported from that district. Niles, Mich., was visited on the 26th by a very severe thunder-storm—houses, barns, hay-ricks and trees were struck by lightning, the telegraph operators were driven from their offices and the instrument destroyed; a number of barns were burned and many cattle and horses killed. The area remained nearly stationary in the Northwest, and at midnight of the 30th was still central in that district. Cautionary signals were ordered up at Chicago, Milwaukee, Section One, Escanaba, Marquette, Duluth, Alpena, Grand Haven and Section Three on the afternoon of the 25th, and at Erie, Cleveland, Section Five, Sandusky, Toledo, Detroit, Section Four and Port Huron on the morning of the 27th. These signals were lowered on the afternoon of the 30th, having been fully justified on the Upper Lakes by velocities of SW. 25 miles at Alpena, SW. 36 miles at Grand Haven, NE. 36 miles at Duluth and SW. 34 miles at Milwaukee. Rough weather prevailed on the Upper Lakes during the display of the signals. The signals were not justified on the Lower Lakes.

No. IX.—Between midnight of the 29th and the morning observation of the 30th the barometer fell rapidly in Oregon and Washington Territory, and on the morning of the 30th an area of low pressure was



central off the west coast of Washington Territory, Portland barometer 0.25 in. below the normal, a fall of 0.26 in. in 8 hours. The barometer continued to fall rapidly in Oregon and Washington Territory, a fall of 0.32 in. in 8 hours being reported from Olympia at the afternoon observation. The depression extended itself rapidly to the eastward, and at the midnight report the barometer at Virginia City, Montana, was 0.39 in. below the normal.

## INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low pressure areas over the North Atlantic Ocean and neighboring waters and continents from the latter part of July to the end of August, 1879, and is based upon data received at this office up to Sept. 30th, 1879. As the title implies, it is not intended for this chart to be considered as anything more than approximately correct, and it is probable that fuller data will change portions of it. Nos. V and VI are based upon the International Simultaneous Observations as described in the *Review* for July, 1879, supplemented by such other observations as have been considered sufficiently trustworthy. Among the latter may be mentioned the observations made on board vessels over the North Atlantic Ocean and published in the Monthly Weather Review of the German Naval Observatory, which have been specially valuable in the tracing of tracks on Chart No. VI.

On Chart No. IV, the tracks of twelve areas of low pressure are traced, and in the upper right-hand corner is a small index giving the first and last dates of each area. Areas No. I, IV, VI, X, and XI are prolonged tracks of areas that have already appeared on Charts No. I of July and August *Reviews*, and should, in accordance with the explanatory note at the foot of map, have been printed partly in black, but owing to an oversight have been printed wholly in red. Three of these, Nos. I, VI, and XI, probably crossed the Atlantic as indicated and materially affected the weather of northwestern Europe during the month of August. Nos. II, III, VIII and IX can not at present be traced further than shown on map. No. V probably existed on the North Carolina coast on August 9th, and moving northeastward produced hurricane winds off the coast of Nova Scotia on the 10th and 11th. No. VI is identical with area No. VII, Chart I, *August Review*; reports already received indicate that this storm existed on the 13th, about in the position shown. On this day (13th) a vessel in 20° N., 60° W., reported rapidly falling pressure, easterly winds, thunder, lightning, and rain, the day ending with heavy squalls, torrents of rain, and severe lightning. At St. Thomas during the 13th, cirrus clouds moved rapidly from the east, and at 1 a. m. of the 14th, heavy rain, thunder, and lightning occurred. Observations made on the island of Grand Turk (21° 32' N., 71° 10' W.) at 10 a. m. give the lowest barometric pressure (29.75) of the month on the 15th, accompanied by a strong NE wind and heavy rains; the latter ranging from 2.10 to 2.23 inches, or about one-half of the entire rain-fall of the month, at Cockburn Harbor, Salt Cay, and Grand Turk. During the day the wind changed to a heavy SE gale, during which the brig "Helen," lying at East Harbor, Turk's Island, loaded and ready for sea, was obliged to ship her chains, after which she drifted ashore. At Santiago de Cuba, heavy showers fell during the night of the 15th and on the 16th, with SE. squalls. On the 16th, Brig "Dashaway" had a severe hurricane, lasting 10 hours, when 20 miles east of Watling's Island, and Steamer Pomona (from Jamaica to New York, and on the 14th, in 19° 45' N, 75° 50' W) reports, 16th, had hurricane from NE. to SSW., blowing with great violence, and a very heavy cross sea, lasting 13 hours. From the 17th to the 19th, this storm was fully described in the *August Review*; it has not been traced after the 20th, on which day it was over Newfoundland. Nos. VII and XII are based upon the reports of severe storms on the dates and in the positions indicated. No. X is a prolongation of area No. IX, Chart I, *August Review*; it was encountered by Bark Elvira, when 50 miles east of the Alacran Reefs. This vessel reports a severe cyclone from ENE on the 20th, which ended next day at 4 p. m. with wind SSE; it was attended by very high seas and terrific squalls. The heavy rains, reported to have ruined the corn crop, in the State of Tabasco, Mexico, may have accompanied this storm. From the 22nd to the 26th, this storm is fully described in the *August Review*—and as there indicated, it probably continued off the Atlantic coast during the 27th. From the 28th to 31st, it passed northeastward, but does not appear to have been accompanied by very severe winds; on the 29th, the Brig Casarina, 41° N, 66° W, was struck by a "whirlwind, commencing at N. and veering to W. and NE. lasting one hour."

*Southern Hemisphere.*—Since the publication of the *August Review* the following reports of severe storms in the Southern Hemisphere have been received: *South Atlantic Ocean.*—From June 23rd to 28th, severe storms prevailed along the coast of South America from Montevideo to Cape Horn; at Montevideo the direction of the wind at first (on the evening of the 23rd) was S. by W., hauling to SSE. on the 24th, and backing to SSW. on the 25th; greatest force of wind, estimated, 11 to 12 from the SSE.; barometer fell to 29.78 on the 23rd and to 29.86 on the 25th and heavy rains, with thunder and lightning, fell on the 24th and 25th. It is reported as the heaviest southeaster experienced at Montevideo for years and much damage resulted to the city and to small craft in the inner harbor; bark Syra was driven ashore and lost. Bark Baltimore from England to San Francisco had a strong gale on June 25th, during which a heavy sea threw the vessel on her beam ends, in which position she remained until the 28th when she was in 57° 54' S., 68° 38' W. June 26th, 1879, ship Frank T. Curling, from Liverpool to Callao, encountered heavy gales when off Cape Horn, and, on the 27th, during a lull in the storm the crew abandoned the vessel and, on the morning of the 28th, were taken on board ship John de Costa, barely in time to escape a renewal of storm; the aban-